

## N-Channel 60-V (D-S) MOSFET

### PRODUCT SUMMARY

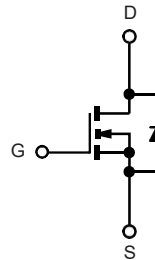
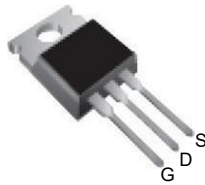
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>
60	0.011 at $V_{GS} = 10$ V	60
	0.013 at $V_{GS} = 4.5$ V	50

### FEATURES

- 175 °C Junction Temperature
- TrenchFET® Power MOSFET
- Material categorization:


**RoHS**  
 COMPLIANT

TO-220AB



N-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)

Parameter	Symbol	Limit	Unit	
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V	
Continuous Drain Current ( $T_J = 175$ °C) <sup>b</sup>	$I_D$	$T_C = 25$ °C	60	
		$T_C = 100$ °C	50 <sup>a</sup>	
Pulsed Drain Current	$I_{DM}$	200	A	
Continuous Source Current (Diode Conduction)	$I_S$	50 <sup>a</sup>		
Avalanche Current	$I_{AS}$	50		
Single Avalanche Energy (Duty Cycle $\leq 1$ %)	$L = 0.1$ mH	$E_{AS}$	125	mJ
Maximum Power Dissipation	$P_D$	$T_C = 25$ °C	136	W
		$T_A = 25$ °C	3 <sup>b</sup> , 8.3 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 175	°C	

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	$t \leq 10$ sec	15	18
		Steady State	40	50
Maximum Junction-to-Case	$R_{thJC}$	0.85	1.1	°C/W

Notes:

a. Package limited.

b. Surface mounted on 1" x 1" FR4 board.

c.  $t \leq 10$  s.

SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		3	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			250	
On-State Drain Current <sup>b</sup>	$I_{D(on)}$	$V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$	60			A
Drain-Source On-State Resistance <sup>b</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.011		$\Omega$
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$		0.014		
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$		0.018		
		$V_{GS} = 4.5\text{ V}, I_D = 15\text{ A}$		0.013		
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$		60		S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		4200		pF
Output Capacitance	$C_{oss}$			570		
Reverse Transfer Capacitance	$C_{rss}$			325		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		47		nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			10		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			12		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 0.6\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		10	20	ns
Rise Time <sup>c</sup>	$t_r$			15	25	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			35	50	
Fall Time <sup>c</sup>	$t_f$			20	30	
<b>Source-Drain Diode Ratings and Characteristics (<math>T_C = 25\text{ }^\circ\text{C}</math>)</b>						
Pulsed Current	$I_{SM}$				60	A
Diode Forward Voltage	$V_{SD}$	$I_F = 20\text{ A}, V_{GS} = 0\text{ V}$		1	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		45	100	ns

## Notes:

- a. For design aid only; not subject to production testing.  
 b. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**TYPICAL CHARACTERISTICS (25 °C unless noted)**



**Output Characteristics**



**Transfer Characteristics**



**Transconductance**



**On-Resistance vs. Drain Current**

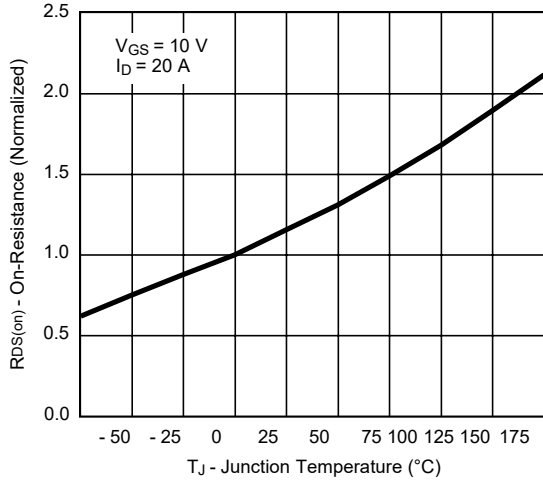


**Capacitance**

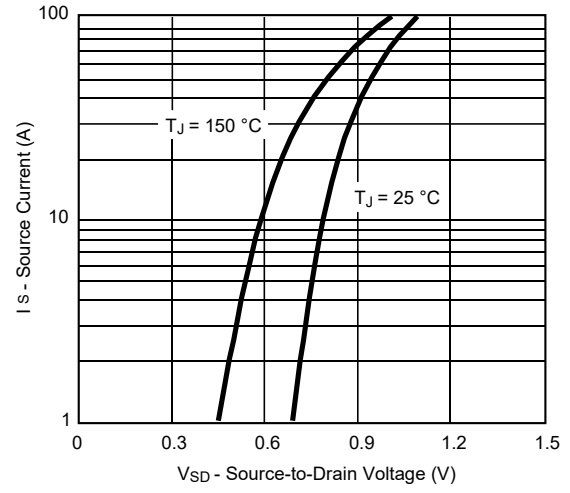


**Gate Charge**

TYPICAL CHARACTERISTICS (25 °C unless noted)



On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

**THERMAL RATINGS**



**Maximum Drain Current vs. Ambient Temperature**



### TO-220AB



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.24	4.65	0.167	0.183
b	0.69	1.02	0.027	0.040
b(1)	1.14	1.78	0.045	0.070
c	0.36	0.61	0.014	0.024
D	14.33	15.85	0.564	0.624
E	9.96	10.52	0.392	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.10	6.71	0.240	0.264
J(1)	2.41	2.92	0.095	0.115
L	13.36	14.40	0.526	0.567
L(1)	3.33	4.04	0.131	0.159
Ø P	3.53	3.94	0.139	0.155
Q	2.54	3.00	0.100	0.118

ECN: X15-0364-Rev. C, 14-Dec-15  
DWG: 6031

**Note**

- M\* = 0.052 inches to 0.064 inches (dimension including protrusion), heatsink hole for HVM

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